Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

TRENTON AND SOMME GRAVEL SPECIMENS COMPARED WITH ANCIENT QUARRY REFUSE IN AMERICA AND EUROPE.

By H. C. Mercer.

The recent Trenton gravel discussion impresses upon us, two important points:

(a) The proved fact that in the fashioning of his larger stone blades, the modern North American Indian continually scattered his quarry sites, with forms like the Trenton forms.[1]

(b) The assertion that the Trenton specimens (see collection at Peabody Museum, Cambridge, Mass., Figs. 4 and 5,) may not have been found in place, but in talus, or where they had "slipped down," and that if in place, they did not prove a paleolithic culture, since if, as is possible, they were "rejects or wasters" dropped at quickly abandoned "workshops" on the uninhabitable river shore, the camp-site of the man who made them, with his "finished implements" and culture-telling traces, would probably have existed elsewhere higher up the bank.

In the demand for renewal of evidence which has grown out of the argument, we not only ask whether the Trenton objects are really found in place, whether they are "finished implements," and whether the old river shores are analogous to modern quarries where the gravel man would leave no more definite trace of himself than a "waster;" but, turning to Europe, whence the discussion has drawn its first inspiration, we wonder what effect the study of American Indian quarries is to have upon the question there. We inquire not unnaturally—

---

[1] For a study of the "unfinished implements" made by modern Indians, at Flint Ridge, Licking Co., Ohio, see a paper by Gerard Fowke in the Smithsonian Report for 1884, and papers by W. H. Holmes upon the aboriginal quarries at Piney Branch, D. C.; and in Garland County, Arkansas, in American Anthropologist for Jan. 1890 and Oct. 1891. The Unpublished Report for 1892 of the Department of Archaeology of the University of Pennsylvania contains a discussion of similar facts discovered in the summers of 1891 and 1892 at Durham, Saucon Creek, Vera Cruz, and Macungie, in Eastern Pennsylvania.

Are the *European* objects really found in place?

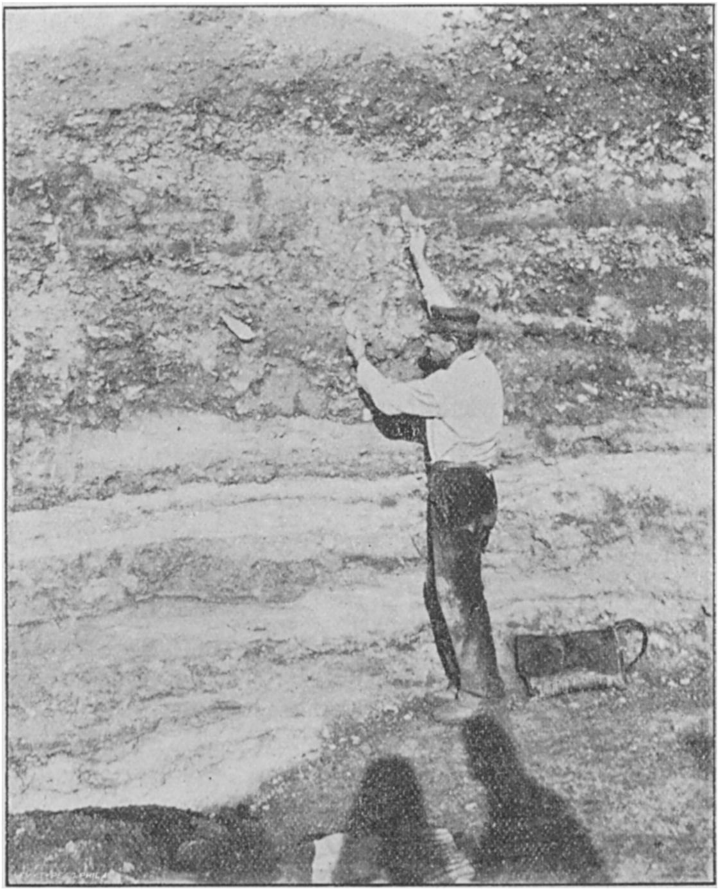


FIG. 1.

Chemin de Poste quarry, Abbeville (upper and oldest terrace), showing the unstratified "Limon rouge" resting upon stratified layers. Workman holds "axes" about where he says he found them in the "Limon rouge," December, 1892.

Do the Trenton specimens really resemble them?

Are the European specimens finished implements?

Have European archeologists overlooked the fact that there are later Stone Age quarries abroad, which, like the American sites, tell the story of blocked out " wasters " resembling gravel forms?

Postponing a few words of suggestion as to the first three questions, I venture here, on the strength of several recent visits to the Somme Valley, to discuss the last four, and first the question of

POSITION IN UNDISTURBED GRAVEL.

It is well-known that the Somme having cut its valley through the secondary chalk of northern France, had, in Quaternary times, washed up beds of gravel at bends, notably at Abbeville and Longpré, and at St. Acheul and Montieres (suburbs of Amiens). It was in these that Boucher de Perthes, after a long battle, was allowed, in 1859, to have really found his " haches " or " coups de poing " in place.

Visiting Abbeville in November last, and securing the kind assistance of M. G. d'Ault du Mesnil, a well-known geologist and paleontologist and member of the Ecole d'Anthropologie, who, as an inhabitant of Abbeville, had devoted much study to the gravels, I examined all the exposures near the town, then those of St. Acheul and Montieres, and finally the cuts at Chelles where the Marne has done the same work.

The sand and gravel pits (see Fig. 2, infra) A, Leon; B, Chemin de Poste; and on the open land, " Champ de Mars "

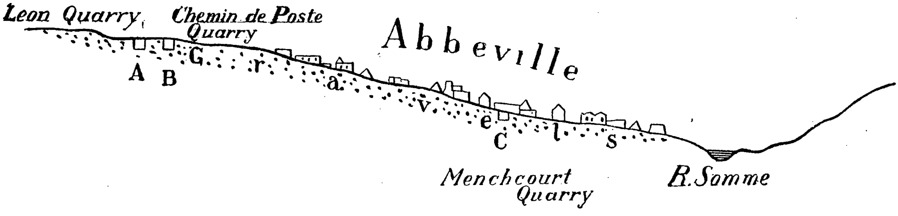


FIG. 2.

Diagram showing the general relative position of the Quaternary gravels to the River Somme at Abbeville (Dept. Somme) France, and A the Leon, B the Chemin de Poste, and C the Menchcourt sand and ballast quarries, from which chipped specimens and fossil bones have been obtained.

behind the town, are about a mile from the tide-less fresh-water Somme, and about 40 meters above it. They are holes dug in gardens and grass fields, on an exceedingly gentle slope, and their position avoids the difficulty of comparatively modern talus encountered at the celebrated Trenton bluff, just as a well or cellar dug in the middle of the latter city would.[2] C is the Menchecourt quarry near the river. A and B might stand as well for the St. Acheul pits if Abbeville were Amiens, when C would do for Montieres.

The gravel pits A and B, at Abbeville, will serve as types. The cuts, now about 10 to 18 feet deep, were, at places, clean and fresh, and showed veins of sand in white, yellow and red, and layers of large flint nodules, round by nature and packed in gravel, the whole overspread by the "Limon rouge," an unstratified layer 3 to 6 feet thick, of sand, gravel and weather-broken flint splinters.[3] Classed as the last phenomenon of quaternary times, this "Limon rouge," tinted brownish red by atmospheric agencies, had, said geologists, rolled like a pudding over all the gravel area, from the uppermost or oldest terrace or bed, to the lowest or latest.

The difference between these exposures and those at Trenton was striking. There, where all stones were water-worn pebbles, and but few constituted blade-material for primitive man (argillite), here, scarcely any were water-worn, and nearly all were blade material (flint). In Trenton there was no fossil-preserving chalk; but here the presence and chemical effects of chalk were everywhere apparent.

---

[2] There is a "Puit" at the Leon Quarry, where at hole formed by decomposition in the underlying chalk, an area of about 75 feet square has settled down 4 or 5 feet. The stratification of the sunken area is somewhat jarred, but its line of faulting clearly marked against the clean cut layers to the right and left. The danger of replacement as well as those of changed water-courses anciently filled up, root holes, uprooted trees, confront the student here as everywhere. Well might he use caution, even were he in a hole 100 yards from the bluff's edge at Piney Branch, at the bottom of a trench 200 feet from the "quartz workshop talus" at Little Falls, or down in the Trenton sewer.

[3] This phenomenon of weather splintering can easily be seen still at work. Many nodules yet unbroken, show on their surface discolored lines fringed with dendrites, marking planes of internal decay which have so weakened the mass that it falls at once into angular pieces on being struck a good blow.

My first object after observing my height above the river and the colored lines of stratification, with their inference of a valley-filling flood, was to note all evidence in proof of the quaternary age of the gravels, and of the occurrence in them of the chipped specimens and fossil bones that had made the spot famous.

I carefully examined every cut at the Leon, Chemin de Poste, and Menchecourt quarries, and afterward searched those at St. Acheul and Chelles, and the Archeological Museum of the University of Pennsylvania now contains three apparently artificial chips, which I then found in place; (1) Museum number 11456 with 3 facets on one side, showing the bulb of percussion, and well worn or worked on the edges, found and photographed in place 1½ meters below the surface at the Chemin de Poste quarry; (2) Museum No. 11454 apparently artificial with 6 facets on one side, in place 2½ meters below the surface at the Chemin de Poste quarry, and (3) Museum No. 11456, a thin flake showing the bulb and concentric circles of percussion, at the Leon quarry 2 meters below the surface. But the flint nodules of Abbeville flake very easily when struck against each other, and when we realize that the gravel deposits have been "ravined" by streams in past time, that cavities have been formed in the chalk, into which the flints have fallen with more or less suddenness and force, and that the original deposition of the strata must have been accompanied with some jostling of nodules, we need not attribute every flake showing the bulb of percussion, to the hand of man.

These specimens though far more artificial looking than many that have been proved artificial by surrounding circumstances must therefore be classed as doubtful, and we will not perplex ourselves with an analysis of their position in its exact relation to unstratified Limon Rouge and the stratified beds beneath.

Beyond these possible traces of human handiwork, I found nowhere a fossil or "coup de poing" in place.

However, at the Leon quarry, a workman showed M. du Mesnil myself 3 typical leaf-shaped specimens, recently found, he said,

PLATE XXI.

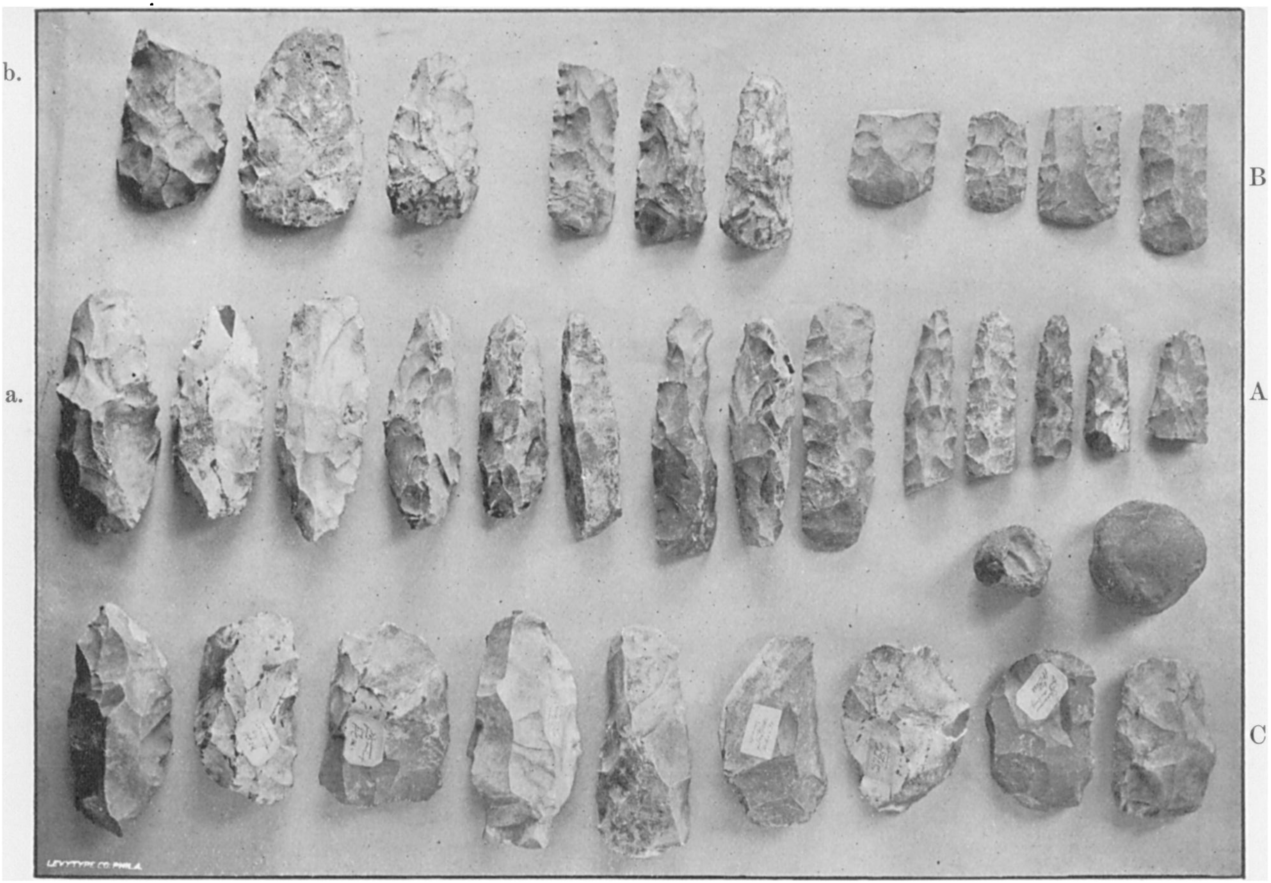


Fig. 6.

Series of specimens from the Neolithic quarry at Spiennes (near Mons, Belgium.)

A. Results. Long thin blades worked toward a point.

B. Results. Chipped Celts—Round cutting edge specialized.

a. Blocked out forms tending toward class A. b. Blocked out forms tending toward class B.

C. Hammerstones and inchoate masses, intent indeterminable, often resembling the ruder forms from Abbeville, American quarry refuse, and Trenton specimens.

by him, one of which was covered with white patina, and three months later (on a second visit), sold me an elephant's tooth at the quarry (for 2 francs). Another laborer at the Chemin de Poste quarry sold me (for 4 francs) four chipped specimens (2 patinated), and again, three months later, 8 (for 5 francs) found by him, he said, in the " Limon rouge " at the spots indicated (see photograph, figure 1). At the Boulevard quarry at St. Acheul, I bought of a third workman, at least a dozen broken "axes" and chips, some of them well patinated, together with the bones of a *Bos primiginius* (for 5 francs).[4] A fourth quarryman, at Chelles, where two tables in the foreman's shed were piled with " axes " and the teeth and bones of the *Rhinoceros tichorinus, Elephas primiginius, Equus caballus* and Reindeer recently found, it was said, and reserved as the property of the company; sold me at his house a number of patinated chips and " coups de poing," together with three teeth of the *Equus caballus* (for 5 francs).

Nothing so distinguishes the Delaware from the Somme Valleys; nothing so eliminates, from the study of the latter, the doubts as to readjustments and talus, the possibilities as to river levels and distant glaciers, which perplex the American investigator, as the presence of these fossils, thus luckily preserved by the chalk, and in sufficient numbers, it seems, to convince all men of science who have visited the spot. Though I found none with my own hands, it would have been hard to believe that those I saw at the quarries, in the Du Mesnil collection, at St. Germain, and in the Boucher de Perthes Museum, at Abbeville, had come from the surface or from anywhere else than the gravels themselves.[5]

[4] One of the flint " axes " he laid aside, saying that it was an imitation.

[5] Beyond these, thus labelling the beds in general as quaternary, the closer study of the bones had enabled paleontologists, I was told, to make out an evolution in the fauna of the valley, and distinguish three divisions or terraces—an upper, the oldest, marked by the prevalence of the *E. antiquus, Rhin. merkii*, and the advent of man; the middle marking the decadence and extinction of the *Elephas antiquus* and the *Rhin. merkii*, the prevalence of the *Rhin. tichorinus*, and the appearance and great increase of the Mammoth; and a lower, the latest, represented by the extinction of the Mammoth and the prevalence of the Reindeer.

The Carriere de Leon, Port St. Gilles, and Chemin de Poste quarries now represent the upper; the Balastiere du Chemin de Fer the middle, and the Menchecourt quarries the lower terraces.

The cut at Moulin Quignon and most of the exposures worked by Boucher de Perthes are at present covered.

As to the artificially chipped flints (see Fig. 3), twelve of those obtained by me were patinated with the brown, yellow, red and white patina that no art can adequately reproduce, for the forged patina is a crust, the real a decomposition into the stone.[6] To prove that they, like the fossils, came from the gravels, no evidence was wanting save that of a personal discovery.

COMPARISON WITH TRENTON SPECIMENS.

Did the Trenton forms resemble these French objects? was the next question. Figure 3 (omitting the so-called Mousterian flakes specialized on one side, and the thin, knife-like flakes and hammer stones from the upper beds) gives the three

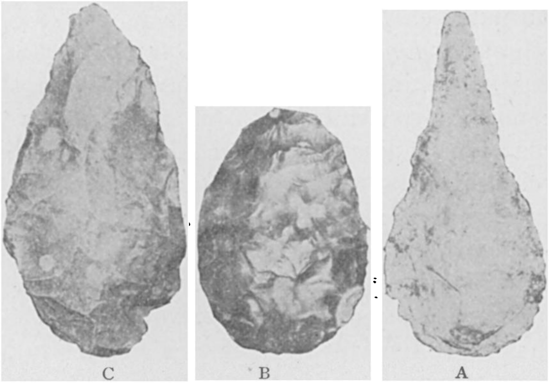


FIG. 3. $\frac{1}{4}$

Typical specimens of flint from the Somme gravels at Abbeville. D'Ault du Mesnil collection. (Photographed by the kind permission of M. G. d'Ault du Mesnil.)

A. Specialized only at the point. Rude at the base.
B. Specialized all round. Leaf-shaped.
C. Unspecialized. Resembling usual Trenton forms.

---

[6] Some "forging" of specimens has been carried on in the Somme Valley, as the drawers full of imitations at St. Germain, and the specimens shown me in the Du Mesnil collection prove. M. du Mesnil has even detected skillful attempts at imitation of white patina at Amiens. He informed me that my unpatinated specimens were genuine. But they can be eliminated from the evidence without depriving it of much force.

important shapes found in the Abbeville pits. Figs. 4 and 5 present fifteen representative specimens from Trenton, in the Abbott collection at the Peabody Museum, Cambridge, Mass.

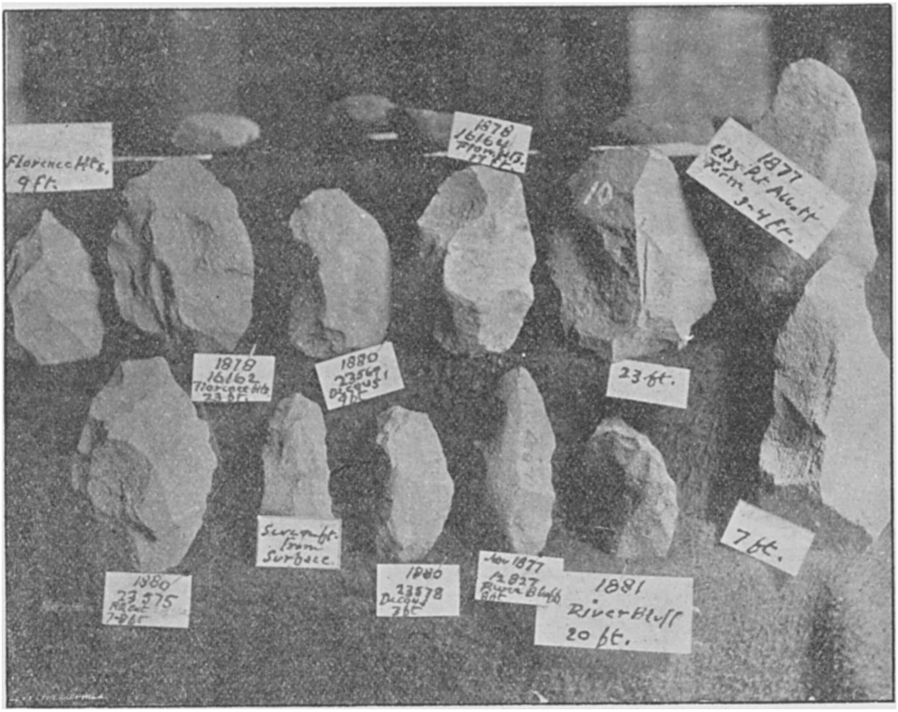


FIG. 4. $\frac{2}{7}$

Trenton specimens of argillite from the Abbott collection, Peabody Museum, Cambridge, Massachusetts (photographed by kind permission of Professor Putnam, and Dr. C. C. Abbott, in September, 1893). Tickets show catalogued number of specimens, date of discovery, site, depth in Trenton gravels, etc., as stated in the Museum records.

The Trenton forms generally resemble C, Fig. 3. None are so finely worked as B (the duplicate of our heavier cache specimens[7]), while A, the most striking of all the "coups de poing," scarcely worked at the large end where the nodule surface often remains, and finely specialized into a narrow point at the other, is, with the exception of the three specimens in Fig. 5, (the only ones of the kind from Trenton with a record as to depth and position), unlike anything in the described Trenton series, nor is it fairly duplicated by any of the American quarry or workshop discoveries that I have seen.

---

[7] As, for instance, the 8185 flint blades arranged in sets of about 15, in mound 5 of the Hopewell group on the north Fork of Paint Creek, Ross Co., Ohio, discovered in 1847 by Squier and Davis and fully exhumed in 1891 by Mr. W. K. Moorehead (Primitive Man in Ohio, p. 189) or the 6107 similar blades, similarly placed, found by Dr. J. F. Snyder in 1890 in a mound on the right (Illinois) river bank near Beardstown, Brown County, Illinois. (See The Archeologist for Oct., 1893.)

In the Boucher de Perthes Museum there are (down stairs) 48 specimens of A, (Fig. 3) and 47 of B. In the British Museum, 192 British specimens of A (Fig. 3) and 30 of B. Of C there are 32 in the Boucher de Perthes, and 97 (from Britain) in the British Museum, and the fact that these latter, save in material, are exactly resembled by the Trenton forms and American quarry specimens, brings us to the next question.

IMPLEMENTS FINISHED AND UNFINISHED.

Are the European specimens finished implements? In attempting to answer which the following facts offer some suggestion.

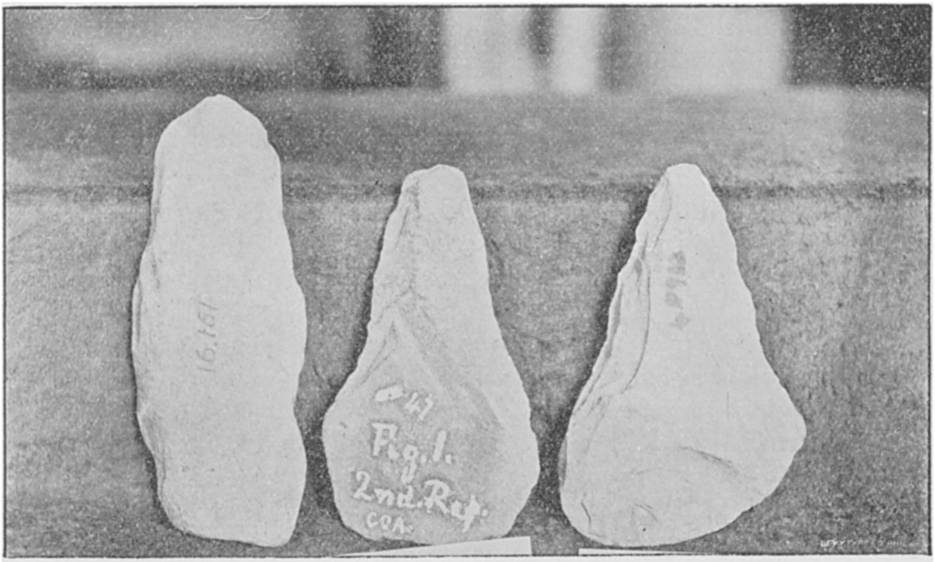
Of the 48 French (Boucher de Perthes, Abbeville) examples of A (Fig. 3), all very rude and unworked at base, where 28 retain the pebble surface, 29 are quite unmistakably specialized at the point; and of these 29, 10 look freshand unused, while 19 seem to show signs of use or water wear. Of the 152 British (Museum) A's, 96 are unmistakably specialized at the point, while very rude, and generally showing nodule surface at the base.

Eleven of the 47 French B's (well-specialized all around, 3 to 5 inches long), show signs of use or rolling.

Of the 32 French C's about 14 look rolled or used, and of the 97 British C's (of which W. G. Smith's unused-looking specimen resting on the elephant bone, in the "Paleolithic floor" case, is one), about 20 are made, not of flint, but of red quartzite.

Water, rather than use, may have rolled and nicked the edges of any of these flints (except, perhaps, W. G. Smith's) since they were made, and if we must eliminate these battered cutting edges (which I did not look for in the British cases) from the pros and cons of a gravel specimen, whether in Europe or America, nothing remains for the student but analogy with stone implements from other regions.

Judged by this, the 77 French and British B's might have to be left out, because they resembled American cache forms. But the 19 French and the 152 British A's, rude masses tapering to fine points, could not, until some ground of doubt is suggested, escape the category of finished implements.



No. 16161.
4 feet from surface,
R. R. cut, 1878.

No. 11752.
Gravel of Trenton
bluff, 7 feet.

No. 45913.
R. R. cut, 7 feet.
May, 1888.

FIG. 5. ½

Three Trenton specimens (Abbott collection, Peabody Museum, Cambridge, Mass.), rude at base and worked to points, resembling (though lacking the specialization of the latter) the rough based pointed forms from Europe (see FIG. 3, A). The labels on the margin give the Museum record.

As to the position of these forms in the Somme gravels, M. du Mesnil makes a statement which, though contradicted by

---

[8] Five of the 47 French are little ones, from 2½ to 3 in. long, also well-specialized. The 30 British specimens of B are much ruder than the French. There are also 5 or 6 little French specimens, 2 to 2½ in. long, of the rude pattern C. Eighteen French or 56 British look like blocked out or unfinished forms of A.

certain archeologists is of the greatest interest to the American student—that while A and C begin at the oldest layers and continue through the newest, B only begins in the middle stratum (with the Mammoth), to continue thenceforth with the others to the top.[9]

Granted the correctness of this observation, the student of American quarries would be tempted to call C, when lying as it does in the later beds, at or near the more perfect forms, a "waster or reject," a preliminary step in their manufacture.

When found alone, however, in lower strata of the same gravel, he must fairly ask whether it does not represent an earlier stage in the process of stone chipping, when the savage, unskilled to proceed farther in the then experimental art, would have halted and treated as a finished tool, the same form which later, where finer work was understood and required, he would have cast aside as a "reject."

This brings us to the last question:

THE "WASTER" OF THE EUROPEAN ("NEOLITHIC") QUARRY.

Are there late Stone Age quarries abroad, which, like the American sites, tell a story of bocked out "wasters" resembling gravel forms?

At Grimes Graves (near Brandon, Suffolk, England) Canon Greenwell found, in 1880, surface conditions resembling those at Macungie, Lehigh Co., Pennsylvania).[10] After digging 40 feet down into an ancient pit, he discovered horizontal galleries, and in them several chalk cups, a phallic figure cut in chalk, and pick-axes made of stag antlers, on one of which was the muddy imprint of a human hand. Cissbury (near Worthing, Sussex, England) explored by Col. A. Lane Fox, in 1867–75, repeated in general these discoveries.

---

[9] The opponents of this statement say that B has been found in the oldest layer. Its advocates, that when such has seemed the case, the specimens tumbled down through the ravining of streams. Unfortunately, it appears that in the demonstration of these points, few exact records have been kept of the stratigraphic position of specimens discovered. None, as far as I could learn, had been photographed in place, and probably not one in fifty was found by a scientific observer with his own hands. "We need," said M. Reinach, in the St. Germain Museum, "a kind of hermit to live in the quarries, and pounce upon specimens as workmen find them."

[10] See Notes on Exploration of Aboriginal Jasper quarries in the Lehigh Hills in 1891–92 (Popular Science Monthly, September, 1893.)

At Grand Pressigny (near Tours, France), the fields are scattered with nuclei and thin flakes of flint worked from neighboring rock in situ, and no doubt there are hundreds of other European quarries yet unexplored, illustrating the handicraft of peoples living in times geologically more recent than the drift.[11]

But Spiennes (near Mons in Belgium) will suit our purpose. Here M. M. Cornet and Briart saw, in 1868, a railway cut expose pits and horizontal burrows as at Grimes Graves and Cissbury, in one of which, at a depth of 8 or 10 feet, a fire-site and potsherds were found. The surface and slope of the chalk hill along the little valley of the Trouille, though talus hides the pit profiles, and the surface depressions are level, is still littered thick with refuse, which is, if we may believe European archeology, the work of a man who could make pottery and polish stone tools, and who, as compared with the Drift savage of the Somme is, geologically speaking, a modern individual.

I visited Spiennes in March, 1893, and, after seeing a neighboring collection, and carefully examining the refuse-covered area and several piles of " pierres taillès " in adjoining gardens, gathered with my own hands and obtained from peasants on the spot, a fairly illustrative series of the chipped forms of the quarry.

Figure 6, omitting nuclei and unworked chips, represents the types of the collection (142 specimens in all, including 4 hammer-stones).

Again, as in the American quarries, the story of partly finished implements preceded by " wasters " and inchoate forms, is plainly told. The considerably specialized results of the stone chipper's work at Spiennes, are shown in the two groups, A and B.

---

[11] I. e., according to the European classification, the men of (a) the cave period, (b) the neolithic period, (c) the bronze period.

The paleolithic cave men, who, as we are told, never polished stone, polished bone, and scratched outlines of animals on bone, superior in realistic skill to anything done in the Bronze and Neolithic Ages. At Solutre, they chipped long, thin blades, equal to fine Mexican and Californian specimens, and at the quarries and workshops where these were fashioned, the American student might expect to find a set of " wasters " very familiar in appearance, yet certainly "paleolithic."

Of A—a long, narrow blade, worked to a point—I have 7 broken examples, and of B—the chipped celt—worked to a round cutting edge, 8 specimens likewise broken. Both A and B are plainly ushered in by a series of rude, less-specialized shapes, group a (of which there are 36) tending toward A, and group b (of which I have 35) tending toward B.[12]

When we come to group C, representing a series of inchoate masses, 19 in number, too little worked to be classified with the rugged relatives of either A or B, we realize a self-evident fact often before forced upon our attention. Having descended too far in the scale of chipped forms, we have lost our bearings. Judgment by type is at an end. Inference is dangerous. We have reached the point where the fortunately-discovered hearth, the blackened potsherd, or half-eaten bone must help to tell the tale—the point where all stones flaked but of a few chips, like "all cats in the dark," are alike.

And the fact that this group C, from Spiennes, certainly runs into and resembles the rude drift forms from the Somme (Fig. 3, C) the American quarry-refuse specimens above noted, and Trenton Specimens (Fig. 4) means but little, when we observe, as we must, that the most specialized forms from the Spiennes quarry (Fig. 6, A and B) and Drift (Fig. 3, A and B) are quite unlike. Here we infer, if we may infer anything from the shape of worked stones, that where the quarry man was aiming at a thin, elongated blade, or a celt with round cutting edge, the Drift Man was working out a broad, leaf-shaped form, or the unique massive ended "coup de poing."

---

[12] Two broken, polished celts, (group B) were obtained by me from a peasant at Nouvelles, 1½ miles away. But a peasant at Spiennes spoke of finding polished celts near the pits. So does Canon Greenwell, quoting M. M. Cornet and Briart in Journal of London Ethnological Society, 1871, p. 433.

The above numbers are given as they, from my own observation, seem to show roughly the relative proportion among the refuse, between the more finished and rude forms.

SUMMARY.

To sum up the above conclusions. A visitor, though refusing to take anything on authority, could find no fair reason to doubt that the French implements are found in place in the Somme gravels associated with quaternary fossils, as asserted by European writers. The whole question is simplified by the frequency of bones.

The Trenton specimens, though resembling the ruder and less specialized French types, never duplicate the specialized forms. The shape alone of the remarkable "coup de poing" (Fig. 3, A) separates it from all Trenton specimens (except the three in Fig. 5). But its best examples are well-specialized, as is its more familiar leaf-shaped companion (Fig. 3, B), while none of the Trenton specimens are so.

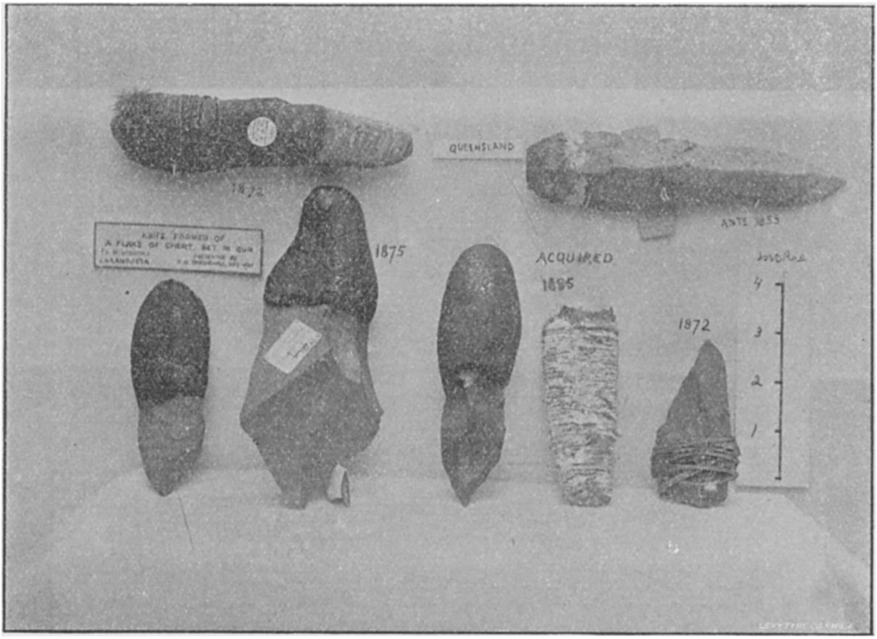


FIG. 7. $\frac{2}{1}$

Australian stone flakes (unspecialized) set in gum handles and used as knives. (Photographed by kind permission of Mr. C. H. Read, British Museum).

Judged by the American quarry standard, certain of the above-mentioned ruder French forms (Fig. 3, C) might be classed as "rejects" thrown aside by the Drift Man in the fashioning of his finer blades (A and B).

The European neolithic quarry of Spiennes, like the American quarries, illustrates the production of "wasters" in the fashioning of large stone implements. But, in its more specialized results, the chipped celt and the long, narrow blade, it offers no resemblance to the leaf-shaped "hache" (Fig. 3, B) and the massive-ended "coup de poing" (Fig. 3, A) of the Somme drift.

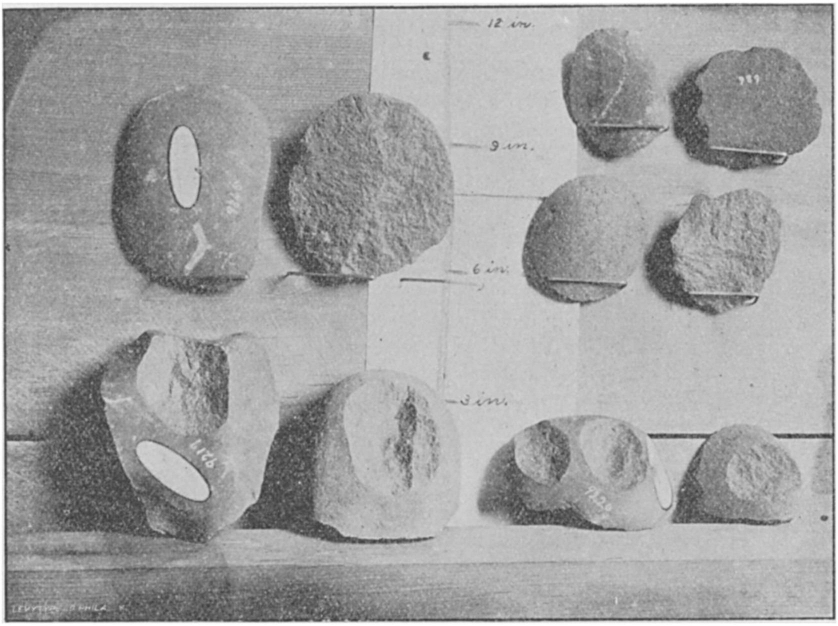


FIG. 8. $\frac{4}{13}$

Stone discs (resembling the "Teshoas" seen by Dr. Leidy in use among the Fort Bridger Shoshones as hide scrapers, in 1870) and river pebbles from which similar discs have been chipped. Found at Indian surface village sites in Delaware and Susquehanna Valleys in 1892.

While making these comparisons, we have realized that the light thrown upon the subject by the study of American quarries, important as it is, by no means settles the manner by which all peoples in an age of stone made their blade-like implements, or gives us a universal clue to a "finished implement" wherever found.

We must bear in mind (1) that the Easter Island hafted obsidian splinters (Fig. 9) and the Australian unworked flakes (Fig. 7) set in masses of "black boy" gum, for use as knives, hammering tools or saws, prove that specialization is not a universal test of a finished implement. Though as "finished" as arrow-heads, who would call them so when the mounts had rotted? And who could distinguish the white flint flakes used recently by the Andamanese to shave their heads,[13] or the Admirality Island knife-chips of obsidian minus the gum, from "quarry refuse."

(2) That the "Teshoas" used as scrapers by the Shoshones (observed near Fort Bridger by Dr. Joseph Leidy in 1870),[14] of which I have found duplicates in the Delaware and Susquehanna Valleys, together with the pebbles from which it appears that they have been knocked (see Fig. 8)[15], are, though finished implements, not specialized, and illustrate a phase of pebble chipping not noted in the study of quarries.

(3) That the above-mentioned Easter Island hafted splinters, (See Fig. 9) though again finished implements, could not have been preceded by "turtlebacks" in their manufacture, and that the Jasper flake exhibited in the National Museum (see Ray Collection and Smithsonian Report, 1886, part 1, plate XX) as the starting point for arrow-head making among the north-west coast Indians, would probably not have looked like a "turtleback" or "quarry reject" if cast aside after partial working.

I found several little "turtlebacks" at the Jasper quarry at Macungie (about one inch in length), while the well-worked end of a small blade protruding from a shapeless mass at the Saucon Creek quarry, seemed to evidence a procedure not involving the production of "quarry rejects" of leaf-shaped form. And it seems hard to escape the conclusion that if in some American cases the finished arrow-head or small blade is the fit survivor of a family of leaf-shaped "rejects;" in others (as certainly in the Mexican flake arrow, worked only on one side), it sprung from the nearest available chip, no more resembling the ovate quarry forms and Trenton specimens than would a bit of ill-worked bottle glass cast aside by California Indians.

---

[13] See Observations by Col. A. Lane Fox, Journal of the Anthropological Inst. of Great Britain, etc., May, 1878, p. 446.

[14] See Hayden's U. S. Geological Report for 1873.

[15] See paper on "Pebbles Chipped by Modern Indians, as an Aid to the Study of the Trenton Gravel Implements," Proc. Am. Ass. for Adv. of Sci., Vol. XLI, 1892, p. 287.

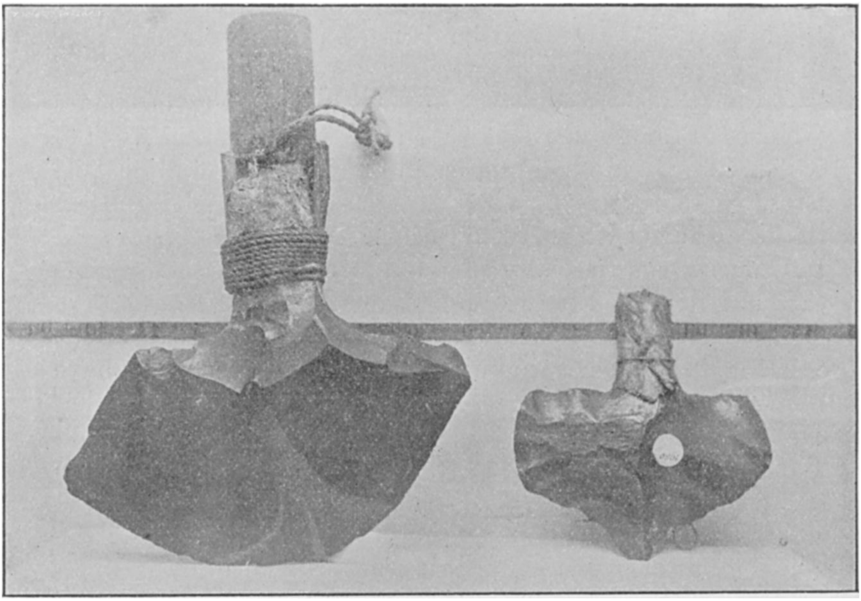


FIG. 9. $\frac{2}{7}$

Rude hafted flakes of obsidian from Easter Island.
(Photographed by the kind permission of Mr. Charles H. Read, British Museum).